

## OF LIABILITY

K MAY BE USED ON A SINGLE PC ONLY.  
E ON A NETWORK (OF ANY KIND). YOU  
RANTS PERMISSION TO USE THE PROD-  
NOT GIVE YOU RIGHT OF OWNERSHIP  
CT CONTAINED ON THIS CD. USE OF  
ON THIS CD IS LIMITED TO AND SUB-  
SPECTIVE PRODUCTS.

AND/OR ANYONE WHO HAS BEEN IN-  
R PRODUCTION OF THE ACCOMPANY-  
THIRD-PARTY PRODUCTS CONTAINED  
N THE BOOK, CANNOT AND DO NOT  
LTS THAT MAY BE OBTAINED BY USING  
BOOK. THE AUTHOR AND PUBLISHER  
SURE THE ACCURACY AND FUNCTION-  
PROGRAMS CONTAINED HEREIN; WE,  
ANY KIND, EXPRESS OR IMPLIED, RE-  
PROGRAMS OR CONTENTS. THE SOFT-  
WARRANTY (EXCEPT FOR DEFECTIVE  
THE DISK OR DUE TO FAULTY WORK-

LOPERS OF THIRD-PARTY SOFTWARE,  
DUCTION AND MANUFACTURING OF  
DAMAGES OF ANY KIND ARISING OUT  
SE) THE PROGRAMS, SOURCE CODE, OR  
IS PUBLICATION. THIS INCLUDES, BUT  
OR PROFIT, OR OTHER INCIDENTAL OR  
JT OF THE USE OF THE PRODUCT.

CLAIM OF ANY KIND IS EXPRESSLY LIM-  
AND/OR CD-ROM, AND ONLY AT THE

DO CERTAIN "EXCLUSIONS" VARY FROM  
TO THE PURCHASER OF THIS PRODUCT.

# COMPUTER GRAPHICS DICTIONARY

---

edited by

Roger T. Stevens



CHARLES RIVER MEDIA, INC.  
Hingham, Massachusetts

Copyright 2002 by CHARLES RIVER MEDIA, INC.  
All rights reserved.

No part of this publication may be reproduced in any way, stored in a retrieval system of any type, or transmitted by any means or media, electronic or mechanical, including, but not limited to, photocopy, recording, or scanning, without *prior permission in writing* from the publisher.

Publisher: David F. Pallai  
Production: Publishers' Design & Production Services, Inc.  
Cover Design: The Printed Image

CHARLES RIVER MEDIA, INC.  
20 Downer Avenue, Suite 3  
Hingham, Massachusetts 02043  
781-740-0400  
781-740-8816 (FAX)  
info@charlesriver.com  
www.charlesriver.com

This book is printed on acid-free paper.

Roger Stevens. *Computer Graphics Dictionary*.  
ISBN: 1-58450-019-0

All brand names and product names mentioned in this book are trademarks or service marks of their respective companies. Any omission or misuse (of any kind) of service marks or trademarks should not be regarded as intent to infringe on the property of others. The publisher recognizes and respects all marks used by companies, manufacturers, and developers as a means to distinguish their products.

Library of Congress Cataloging-in-Publication Data

Stevens, Roger T., 1927-  
Computer graphics dictionary / Roger T. Stevens.— 1st ed.  
p. cm.  
ISBN 1-58450-019-0  
1. Computer graphics—Dictionaries. I. Title.  
T385 .S772 2001  
006.6'03—dc21

2001005473

Printed in the United States of America  
02 7 6 5 4 3 2 First Edition

CHARLES RIVER MEDIA titles are available for site license or bulk purchase by institutions, user groups, corporations, etc. For additional information, please contact the Special Sales Department at 781-740-0400.

Requests for replacement of a defective CD must be accompanied by the original disc, your mailing address, telephone number, date of purchase and purchase price. Please state the nature of the problem, and send the information to CHARLES RIVER MEDIA, INC., 20 Downer Avenue, Suite 3, Hingham, Massachusetts 02043. CRM's sole obligation to the purchaser is to replace the disc, based on defective materials or faulty workmanship, but not on the operation or functionality of the product.

## frame buffer

tion time, the game allocates a single memory block from the operating system, which will be used and managed by the frame memory system. This memory block is allocated only once throughout the lifetime of the game and is released back to the operating system just before the game terminates. From the memory block's pointer, we compute the base and cap memory pointers, optionally aligning them to a memory boundary that fits the specific system the application was designed to run on. The base pointer points to the lowest aligned memory address in the memory block, and the cap pointer points to the next higher-aligned memory address just outside the top of the memory block. The memory block, the base pointer, and the cap pointer remain constant throughout the life of the game. Finally, the lower heap frame and upper heap frame pointers are set equal to the base and cap pointers, respectively. These two pointers change as allocations are made during the course of the game. A call is made to the system, requesting a chunk of memory from one of the two heaps. If the lower heap is specified, the lower heap frame pointer is bumped up by the amount allocated, and its value prior to the modification is returned. The lower heap frame pointer always points to the next available byte of memory. If, on the other hand, the upper heap is specified, the upper heap frame pointer is decreased by the amount allocated, and the new value is returned (because the upper heap frame pointer always points to the last allocated byte of memory). If the two frame pointers cross each other, there is not enough memory to satisfy the request.

**frame buffer.** A hardware device that provides an interface for a frame of computer data to the monitor. It contains memory to store the color of each pixel together with circuitry to manage input to the memory and output in a form that can be accepted by the monitor.

**frame buffer synergy.** The use of image memory in such a way that it may store the output of one program which can be used as the input for another program.

**frame-by-frame animation.** Animation using a series of *keyframes* with no *tweening* that creates a "flipbook." An animation *Flash* file is an example of a frame-by-frame animation.

**frame grabber.** A device that converts a video picture into a digital file.

**frame rate.** 1. In video or film recording, the number of frames per second that are recorded (and then played back). 2. In computer games, especially 3D games, the rate at which frames are created and displayed on the computer screen, just like the frames of a movie. One critical difference, however, is that when a movie's frame rate suddenly drops to half speed, the film itself is playing half speed. In a game, when the frame rate drops, the "world" is still moving at the same speed, but the player is seeing half as many frames. So the action the player is watching is still running at the same speed, but the motion appears choppy.

**frames per second (fps).** Used to describe the speed at which film and video play. Film plays at 24fps, PAL video at 25fps, and NTSC video at 29.97 fps. Frame speed can seriously affect the quality of video games as it relates to "real-time rendering."

**Frax4D/FraxFlame/FraxE.** Series of *Photoshop* plug-ins. *KPT* volume. Each can be used for fractal-based imagery.

**free-form.** An image that is hand-drawn without use of rulers or other mechanical devices.

**free form model.** A model of a cylinder that is created by extruding a square or circle. Free form models respond better to the use of primitive models.

**Free Form Modeler.** A 3D modeler in *Carrara* that works by an extrusion method that is defined by profiles in all three dimensions.

**FreeHand.** A high-end Macromedia vector-graphics application. Macromedia *Freehand* is a professional solution for designers publishing in print and on the Web, offering sophisticated illustration tools, time-saving productivity features, and integration with the family of Macromedia publishing software, including *Flash*.

**freehand lasso.** A tool used in *FreeHand* to select areas for modification.

**freeview.** A simple technique for three-dimensional viewing that places images side by side, left on the left and right on the right. The viewer keeps the axes of the eyes parallel to the display, while focusing on the display. Initially, this is a simple technique, and some practice may be required.

ous polynomial A  
nting a curve by a  
nial.

in which a circle re-  
and is divided into  
l segments, each rep-  
of the whole having

l in Java to denote a  
arc with color. Since  
sed figure, some as-  
e made as to how it  
ie fill is used, Java ac-  
eight line from each  
he center of the un-  
ellipse and then fills  
d figure with color.

nable artifact that oc-  
scan lines of insuffi-  
on to create letters.

er wheel that presses  
against the capstan  
ssure to assure that  
ains constant during  
g.

stortion of the image  
n which the middle of  
nd sides of the display

infinite exchange of  
wo patches that face  
alculating radiosity by  
ing patches or mesh-  
are facing each other,  
once back and forth

he simplest form of  
j of a box with a pin-  
er of one wall and a  
he inside of the other  
the pinhole is small

enough, it acts as a good-quality lens of  
very small aperture.

**pink noise** A completely random ampli-  
tude signal whose power is inverse to  
frequency. Also known as  $1/f$  noise.

**pipelining** The partitioning of a compu-  
tation into stages that can be executed  
sequentially in separate processing ele-  
ments. This reduces total processing  
time when a number of similar computa-  
tions are involved.

**pistol-grip tripod** A tripod with a head  
that is controlled by a single pistol-grip  
mechanism. Such heads can be freely ro-  
tated around all axes simultaneously,  
making it very difficult to perform a  
smooth motion along a single axis.

**pit.** A laser-created indentation in an op-  
tical disk that represents a bit of data.

**pitch** 1. The number of characters per inch  
in a line of text, measured horizontally.  
This number is meaningful only for fixed  
spacing fonts, since proportional fonts

have a different *pitch* for every charac-  
ter. 2. The angular displacement of an  
object about the x axis in the x-y plane.  
3. The distance between the centers of  
RGB phosphor triads on a cathode ray  
tube screen.

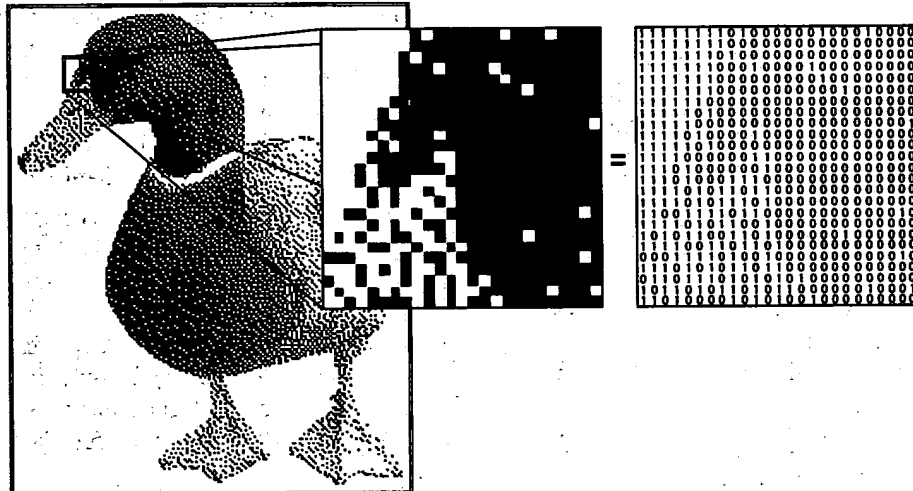
**pixblt** See *bitblt*.

**pixel** Short for *picture element*. A single  
element of a discrete display. Also  
known as a *pel*.

**pixel aspect ratio** The ratio of the hori-  
zontal length of a pixel to the vertical  
length of the pixel. Computer monitors  
have square pixels. However, pixels are  
rectangular in some video formats. In  
order to work with such formats on a  
computer monitor, software that corrects  
the picture on the monitor is required.

**pixelation** An effect created when a tex-  
ture map with insufficient resolution is  
mapped onto a surface.

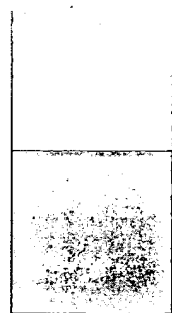
**pixellization** A video effect in which an  
image is divided into a grid containing



pixel.

inder. When the  
is pressed,  
vs and then the

of light rays  
the boundary  
materials. The  
measure of this  
ent to the ratio  
t in the two



the phosphor of  
repeatedly posi-  
in at the same  
phosphor to glow  
ading after the  
recharge cells of  
at data stored in  
id get lost.

: which refresh  
vision this is 60  
d.

technique for  
vindow that has  
becomes visible

erse that regen-  
: after the user

**region of interest (ROI)** A portion of an image that is selected for further examination or processing.

**registration** The alignment or degree of alignment of two or more images that are to overlay. For example, in color printing, the red, green, yellow, and black ink images must register exactly to produce a quality color picture.

**regularized Boolean set operations** Operations of Boolean algebra that are defined in such a way that operations on solids always yield solids.

**relative address** The address of a datum in computer memory with respect to some reference address already stored in the computer. The sum of the reference address and the *relative address* should be the *absolute address* of the datum. Compare with *absolute address*.

**relative index of refraction** A measure of the amount of light that is refracted when a light ray passes through the surface of two dissimilar materials.

**relaxation techniques** Techniques in which an object that is required to meet certain constraints is moved so that the constraints become closer to being satisfied.

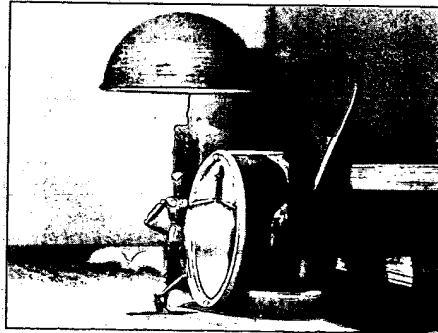
**release print** A print of a film that is sent to a theater for projection.

**Rembrandt lighting** The placement of a key light to the side of the camera with the light focused on the subject. The position of the key light in Rembrandt lighting is normally elevated above and placed to the side of the subject in portraiture. This placement illuminates three-quarters of the subject's surface. Rembrandt lighting is derived from the position of the sun in late morning or

late afternoon, when it is above and to the side of the subject. The light at this position is flattering in the way it models the subject into a three-dimensional form. The contours and form of the face are revealed. This is the classic position of key light in painting and photography. Also known as *¾ lighting*, *quadrant lighting*, or *45-degree lighting*.

**remote procedure call (RPC)** A software function that is used while a computer is running another program, enabling it to run a subprogram on another computer in the same network.

**render** The computer process of taking the three-dimensional model with its accompanying textures and lights, and turning that into a two-dimensional image composed of an array of pixel colors. In simplest terms, when a computer "renders" it paints all the information thus far created. ©



render.

**Render** An icon in *trueSpace* that allows the user to select such options as ray-tracing and antialiasing.

**renderfarm** A group of computers used to render a single animation. Each computer in the series renders every x number of frames.

encoded as a sequence of addresses to a table of small blocks of pixels that are relatively close representations of blocks of pixels in the original image. This technique is known as *vector quantization* because each block of pixels represents the components of a vector and attempts to find vectors that are close together.

**vectorscope** A special monitor for calibrating the hue, or color information, in a video signal.

**vector space** A space consisting of a set of elements, called *vectors*, where addition and multiplication by a constant can occur.

**Vectorworks** A 2D/3D vector graphics application from Nemetschek. For direct rendering of *Vectorworks* drawings, the *Renderworks* plug-in may be appropriate.

**vergence** When one holds his index finger about 14 inches from his face and slowly brings it closer until his eyes can no longer focus on it clearly, there is, at that point, a perceptible image disparity. The eyes looking at an object 300 feet away, however, do not detect a discernible disparity. This is because each image on the retina is almost identical, and there are no eye muscle strains. As the image gets closer, however, the eyes begin to experience image disparity as well as eye strain. This experience generates the sixth eye movement, which is called *vergence*. To gauge distance, the brain strains the eye muscles.

**verification suite** A set of tests developed to verify that a program meets all of its specifications. Use of the verification suite is essential to ensure that program modifications do not introduce secondary bugs.

**verso** In typography, the left-hand page of a book or magazine. The right-hand page is known as the *recto*.

**vertex** A point which marks the intersection of two or more edges of a polygon or other graphics object.

**vertex collapse** Deciding which edge of a mesh is least significant and removing this edge by making the two vertex positions at its ends equal. This edge collapse operation typically makes two triangles sharing the edge redundant. Detail is put back into the mesh by reversing these collapses through vertex splits.

**vertex level deformation** A technique, available in many 3D applications, that enables the programmer to see the vertices where polygons meet to pull and push those points. It simulates "virtual clay." Many programs show the vertex points as Bezier handles or spline points. This assists in creating smooth deformations so the programmer can "pull" those points out to make a rounder face.

**vertex normal** A normal vector at a vertex of a graphics object. Rather than being normal to one of the intersecting surfaces, it is normal to the average of the surface normals of all of the intersecting surfaces.

**Vertex Paint** A modifier in *3ds max* that allows the user to paint the selected vertices of an object different hues.

**vertical banding** Bright vertical smears that can occur in some video cameras when the camera is pointed at a very bright source.

**vertical blanking interval** The period during which a video image goes blank as the electron beam returns from scanning

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☒ **BLACK BORDERS**
- ☒ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☐ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☒ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER:** \_\_\_\_\_

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**